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Efficacy of a four-drug combined regimen compared to uterine curettage in the treatment of incomplete medical abortion: a prospective observational study

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Abstract

Objective To investigate the clinical efficacy of the combined regimen of four drugs (drospirenone and ethinylestradiol tablets (II), mifepristone, misoprostol, and Xinshenghua granules) for the treatment of incomplete medical abortion (MA).

Methods 184 patients diagnosed with incomplete MA were recruited and divided into two groups: the combined medication group ($n=92$) and the uterine curettage group ($n=92$). Patients in the combined medication group were treated with a combined regimen of four drugs, while those in the uterine curettage group were treated with uterine curettage.

Results After treatment, the diameter of residue (0.00 VS 4.26 ± 2.34 mm, t=-3.359, $P=0.010$), days of vaginal bleeding (9.79 ± 1.76 VS 11.92 ± 1.91 days, t=-4.688, $P=0.010$) and return time of menses (28.58 ± 2.67 VS 31.24 ± 2.43 days, t=-4.238, $P<0.001$) of the combined medication group were significantly lower than those of the uterine curettage group. The duration of menstruation (6.12 ± 1.12 VS 5.11 ± 0.98 days, t=-2.681, $P=0.007$) and the proportion of menstrual volume equal to past menstruation after return of menses were higher in the combined medication group than in the uterine curettage group (80.43% VS 57.61%, $\chi^2=16.472$, $P<0.001$). No statistically significant difference was observed between the two groups in terms of serum β-HCG levels after treatment ($P>0.05$); the overall response rate was higher in the combined medication group than in the uterine curettage group (97.83% VS 80.43%, $\chi^2=54.331$, $P<0.001$). No adverse reaction events occurred during the treatment.

Conclusion The combined regimen of four drugs boasts favorable efficacy for the treatment of incomplete MA, and is equally efficient as compared to uterine curettage.

Keywords Incomplete medical abortion, Mifepristone, Misoprostol, Drospirenone and ethinylestradiol tablets (II), Xinshenghua granules

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Introduction

Data from the 2020 China Health Statistics Yearbook indicate that as many as 9.76 million induced abortions were performed nationwide in 2019, accounting for 59.5% of family planning surgeries in the same year; this figure also represents a 2‰ year-on-year increase compared to 2018, and a 59.7% increase compared to 2009, when 6.11 million people performed induced abortions [1]. Over the past decade, women with early pregnancies undergoing induced abortion in China have been rising at a rate of approximately 350,000 per year, and are characterized by a high number of repeated abortions, gradual youthfulness, and poor contraceptive awareness. Among high-risk abortions, multiple abortions, unmarried abortions and recurrent abortions within six months consistently take the top three [2, 3]. About 61% of women with unintended pregnancies will end their pregnancy with an induced abortion [4].

Incomplete medical abortion (MA) can be managed by uterine curettage and pharmacological treatment. In previous clinical practice, incomplete MA was routinely tackled by applying uterine curettage, with a high success rate and short operating time. However, the therapy involves major drawbacks, i.e., high level of pain suffered by women, invasive operation, and multiple complications [5]. Pharmacological treatment refers to the use of one or more drugs in combination to treat incomplete MA. Various papers have reported the positive effects of pharmacological treatment in recent years both at home and abroad, among which the drug regimens with a high success rate include the repeated application of mifepristone with misoprostol, sequential treatment with estrogen and progesterone, and mifepristone combined with Shenghua Decoction and other combined drug regimens [6–8]. However, these regimens work for only a portion of the patients. Poorly effective patients will be subjected to surgical treatments such as uterine curettage, resulting in unavoidable secondary damage to their bodies. In the long term, invasive therapies have been shown to be beneficial to some extent in terms of the return of menses, endometrial recovery, quality of life, and psychological stress in patients. It is therefore highly meaningful to explore the pharmacological treatment of incomplete MA.

In the case of incomplete MA, pregnancy tissue is retained in part of the endometrium of the uterine cavity, and ethinyloestradiol acts on the estrogen receptor of the endometrium to stimulate the proliferation of the functional layer of the endometrium. The residual endometrium simultaneously proliferates from the endometrial basal layer to the uterine cavity and transforms into the secretory phase with curved glands and fluffy interstitium under the promotion of drospirenone. Under physiological conditions, the endometrium in the secretory phase is prepared for the nidation position of the fertilized ovum. The endometrium at the residual site, with tissue sparing and interstitial edema, is also prepared for endothelial denudation at the residual tissue attachment after withdrawal [9, 10]. Endometrial detachment begins 2–3 days after discontinuation of drospirenone and ethinylestradiol tablets. On the first and second day after withdrawal, Mifepristone is applied sequentially to accelerate the disintegration and detachment of the endometrium after withdrawal by destroying the distal blood vessels that nourish the endometrium, leading to ischemic necrosis of the endometrium, and thus superimposing a detaching effect on the endometrium at the residual site; Misoprostol is applied next day to stimulate uterine contraction, cervical softening and cervical opening, so that the residual pregnancy tissues are discharged out of the uterine cavity along with the dislodged endometrium and blood. New Biochemistry Granules, a proprietary Chinese medicine with the efficacy of invigorating blood circulation, removing blood stasis and stopping pregnancy, promotes the downward drainage of bad dew to further enhance the therapeutic effect. Xinshenghua granules, a proprietary Chinese medicine with the efficacy of invigorating blood circulation, removing blood stasis and stopping pregnancy, promotes the downward drainage of lochia to further enhance the therapeutic effect. This combined regimen is feasible from the point of view of pharmacological action of the above drugs. Therefore, the present study was conducted to investigate the therapeutic effect of the combined regimen of drospirenone and ethinylestradiol tablets (II), mifepristone, misoprostol, and Xinshenghua granules in patients with incomplete MA as subjects, with a view to providing a new protocol for the treatment of incomplete MA.

Subjects and methods

Subjects

Patients diagnosed with incomplete MA in our hospital from September 2021 to March 2022 were recruited by convenience sampling method and divided into two groups: the combined medication group ($n = 92$) and the uterine curettage group ($n = 92$), as shown in Fig. 1. This study was a prospective observational study. Patients in the combined medication group were treated with a combined regimen of drospirenone and ethinylestradiol tablets (II), mifepristone, misoprostol, and Xinshenghua granules, while those in the uterine curettage group were treated with uterine curettage.

The inclusion criteria were as follows: (1) patients with a period of gestation ≤ 49 days; (2) those aged 18–40 years; (3) those with vaginal bleeding less than usual menstrual volume; (4) those who showed residue < 2.5 cm in diameter in the uterine cavity with blood flow signals seen or not seen in the inhomogeneous echogenic mass

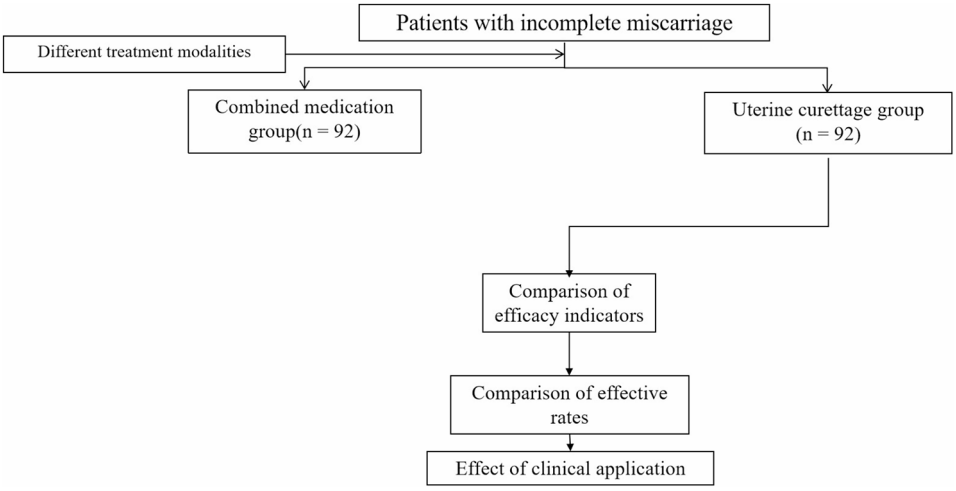

Fig. 1 The flow chart of the study

on ultrasonography; and (5) those with human chorionic gonadotropin (hCG) ≤ 400 IU/L.

The exclusion criteria were as follows: (1) patients with more vaginal bleeding than usual menstrual volume; (2) those with signs of infection requiring prior anti-infective treatment; (3) those in lactation; (4) those with cardiovascular diseases, hepatic and renal insufficiency, endocrine diseases, anemia, nervous system diseases and psychiatric disorders; (5) those for which gestational trophoblastic disease cannot be excluded; (6) those with uterine scar pregnancy, prior cervical surgery or physiotherapy; and (7) those who could not be followed up as scheduled.

The rejection criteria were as follows: (1) patients in the combined medication group who underwent immediate uterine curettage due to more vaginal bleeding than usual menstrual volume during pharmacological treatment; (2) those who could not adhere to the medication regimen; and (3) those who were lost during follow-up.

The sample size was calculated based on the complete abortion rate. Assuming the complete abortion rate of uterine curettage for incomplete medical abortion is 95%, the complete abortion rate of drug therapy is 85%, $\alpha = 0.05$, and power = 90%, the required sample size for each group was calculated to be 84 using the following formula:

$n = (U\alpha + U\beta)^2 \times 2P(1 - P) / (P1 - P2)^2$.

where n is the sample size required in each group, Uα is the U value corresponding to the testing level α, Uβ is the U value corresponding to the power, P is the average of P1 and P2, P1 is the estimated complete abortion rate of uterine curettage group, and P2 is the estimated complete abortion rate of combined medication group.

Considering a dropout rate of 10%, the final sample size was determined to be 92 cases in each group.

Diagnostic criteria for incomplete MA: persistent vaginal bleeding and positive serum β-HCG after 1 week of oral misoprostol, color Doppler ultrasound showed no intact gestational sacs in the uterine cavity, whereas only enhanced echogenic masses, focal abnormal blood flow signals detected in the uterine myometrial wall adjacent to the masses, with measurable low-resistance arterial blood flow spectra [11, 12].

The study was approved by the Ethics Committee of the hospital. All patients in this study signed an informed consent form.

Study methods

Before the treatment, the procedures, adverse effects and precautions of the two treatment regimens were fully elucidated to the patients, especially detailing the possibility of failure of the medication regimen, and ultimately the informed consent of the patients was obtained.

Drugs: mifepristone tablets, 25 mg, manufactured by China Resources Zizhu Pharmaceutical Co., Ltd. Misoprostol tablets, 0.2 mg, manufactured by China Resources Zizhu Pharmaceutical Co., Ltd. Drospirenone and ethinylestradiol tablets (II), 3 mg:0.02 mg, manufactured by Bayer Healthcare AG, Germany. Xinshenghua granules, 6 g, manufactured by Guizhou Hanfang Pharmaceutical Co, Ltd.

The uterine curettage group was treated with conventional uterine curettage performed by experienced obstetricians and gynecologists in our hospital. The patients were informed about the precautions such as review at 1 week postoperatively and 2–3 days after the first resumption of clean menstruation, postoperative prophylactic application of antibiotics for 3 days and daily nursing care.

The combined medication group was given 2 bags of Xinshenghua granules orally twice daily; additionally, the following medications were added at different times: on days 1–12, 2 drospirenone and ethinylestradiol tablets

(II) were taken orally once daily at the same time each day without skipping a dose; on days 13–14, 50 mg of mifepristone was taken orally daily at 8 a.m., and 25 mg was taken orally at 8 p.m. on an empty stomach for 2 h before and after the dose; On day 15, 0.6 mg of misoprostol was taken orally at 8 a.m. on an empty stomach for 2 h before and after the dose, and attended the hospital early on day 15 for observation. If the bleeding was not excessive on day 15, a follow-up visit was made 1 week later for efficacy determination. If the bleeding is more than the usual menstrual volume and lasts for more than 2 h, immediate uterine curettage or hysteroscopy is performed. Antibiotics were applied for 1–3 days at the beginning of pharmacological treatment to prevent infection.

The patients were informed of the medication regimen or asked to keep an eye on the experimental observations such as the duration of continuous vaginal bleeding, the return time of menses, the presence of fever, and lower abdominal pain, so that the data were collected at 1 week after treatment and at the time of review after the first return of menses.

Data collection

General data, efficacy indexes, safety indexes, and efficacy indexes of the patients were collected. General data included: age, gestational week, pregnancy, previous abortion, days of menopause, diameter of residue, and serum β-HCG levels. Efficacy indexes included: (1) gynecological ultrasound: tested once a week to monitor changes in the residue; (2) serum β-HCG levels: tested once a week; (3) vaginal bleeding: filled out a record sheet at the weekly follow-up; (4) return of menses: the return time of menses, the duration of menstruation, and the menstrual volume after the return of menses; and (5) efficacy indexes. Safety indexes included: (1) major vital signs: temperature, pulse, blood pressure, respiration; (2) laboratory tests: blood routine, liver function, kidney function, and four items of blood coagulation.

Referring to the relevant contents of medication abortion in the Criteria of Diagnosis and Therapeutic Effects of Diseases and Syndromes in Traditional Chinese Medicine [13] and Chinese Obstetrics & Gynecology [14] and the efficacy standards for the uterine cavity residue after medical abortion in the Practice of Obstetrics & Gynecology [15], the efficacy judgment was formulated and approved as follows: ① Cured: no residue in the uterine cavity as indicated by ultrasound at the end of the treatment, the serum β-HCG levels decrease to within the normal range, and vaginal bleeding stops; ② effective: reduced uterine cavity residue as indicated by ultrasound at the end of the treatment, the serum β-HCG levels decrease, and vaginal bleeding stops or significantly reduces compared with the previous; ③ ineffective: no change or increase in the size of the uterine cavity residue as indicated by ultrasound at the end of the treatment, insignificant decrease or increase in the serum β-HCG levels, no change or decrease or cessation of vaginal bleeding compared with the previous one, and the need for uterine curettage.

Statistical analysis

All data in this study were statistically processed using SPSS 26.0 statistical software. The K-S method was used for the normality test, and normally distributed measurement data were expressed as (x ± s); the paired t test was used for the comparison of paired design means between groups, and the independent sample t test was used for group design. Non-normally distributed measurement data were expressed as M(Q1, Q3), and comparisons between two groups were performed using the U test; count data were expressed as frequency (n) or rate (%), and comparisons between groups were performed using χ^2 test. A 2-sided P value of less than 0.05 was considered a statistically significant difference.

Table 1 Comparison of general data

Item	Combined medication group ($n=92$)	Uterine curettage group ($n=92$)	Z/t value	*P* value
Age (years, x ± s)	28.21 ± 5.76	28.53 ± 5.49	-0.722	0.473
BMI [kg/m^2, M(Q1, Q3)]	22.47(20.35, 25.45)	22.27(20.05, 24.77)	-0.112	0.912
Time of pregnancy [times, M (Q1, Q3)]	2.0(1.8, 3.0)	2.0(2.0, 3.0)	-0.289	0.773
Number of deliveries [times, M (Q1, Q3)]	1.0(0, 2.0)	2(1.0, 2.0)	-0.613	0.540
Diameter of residue (mm, x ± s)	15.04 ± 6.31	15.21 ± 6.26	-0.112	0.912
Gestational week [weeks, M (Q1, Q3)]	6.0 (5.0, 7.0)	6.0 (5.3, 7.4)	-0.145	0.884
Previous miscarriages [times, M (Q1, Q3)]	0 (0, 2.0)	2.0 (1.0, 2.0)	-0.613	0.540
Days to menopause [days, M(Q1, Q3)]	40.0(38.0, 43.0)	40.0 (39.0, 42.0)	-0.258	0.796
β-HCG levels (IU/L, x ± s)	214.69 ± 52.96	234.51 ± 67.46	-1.327	0.189

Note: BMI: body mass index, HCG: human chorionic gonadotropin

Results

General data

There were 92 cases in the combined medication group, with an average age of 28.21 ± 5.76 years, 2.0 (1.8, 3.0) times of pregnancy, and 6.0 (5.0, 7.0) gestational weeks. There were also 92 cases in the uterine curettage group, with an average age of 28.53 ± 5.49 years, 2.0 (2.0, 3.0) times of pregnancy, and 6.0 (5.3, 7.4) gestational weeks. No statistically significant difference was found between the two groups in terms of age, BMI, times of pregnancies, number of deliveries, and diameter of residue ($P > 0.05$), as shown in Table 1.

Comparison of efficacy indexes

The diameter of residue and serum β-HCG levels of both groups after treatment were lower than those before treatment ($P<0.05$), indicating a certain therapeutic effect of both methods on incomplete MA. After treatment, the diameter of the residue (0.00 VS 4.26 ± 2.34 mm, t=-3.359, $P=0.010$), days of vaginal bleeding (9.79 ± 1.76 VS 11.92 ± 1.91 days, t=-4.688, $P=0.010$) and return time of menses (28.58 ± 2.67 VS 31.24 ± 2.43 days, t=-4.238, $P<0.001$) of the combined medication group were significantly lower than those of the uterine curettage group. The duration of menstruation (6.12 ± 1.12 VS 5.11 ± 0.98 days, t=-2.681, $P=0.007$) and the proportion of menstrual volume equal to past menstruation after return of menses were higher in the combined medication group than in the uterine curettage group (80.43% VS 57.61%, $\chi^2=16.472$, $P<0.001$). No statistically significant difference was observed between the two groups in terms of serum β-HCG levels after treatment ($P>0.05$), as shown in Table 2.

Comparison of response rate

The results showed that there were 92 cases in the combined medication group, of which 87 cases were cured and 3 cases were effective, with an overall effective number of 90 cases; there were 92 cases in the uterine curettage group, of which 41 cases were cured and 33 cases were effective, with an overall effective number of 74 cases. The overall response rate was higher in the combined medication group than in the uterine curettage group (97.83% VS 80.43%, $\chi^2=54.331$, $P<0.001$), as shown in Table 3.

Analysis of safety indexes

The included patients with incomplete MA were monitored before and after treatment with no abnormalities in various safety indexes such as vital signs, blood routine, liver and kidney function, four items of blood coagulation and electrocardiogram, and no adverse reaction events occurred during the treatment.

Table 2 Comparison of efficacy indexes between the two groups

Item		Combined medication group ($n=92$)	Uterine curettage group ($n=92$)	Z/t/χ^2 value	*P* value
Diameter of residue	Before treatment	15.04 ± 6.31	15.21 ± 6.26	-0.113	0.912
	After treatment	0.00	4.26 ± 2.34	-3.359	0.010*
Serum β-HCG level	Before treatment	214.69 ± 52.96	234.51 ± 67.46	-1.327	0.189
	After treatment	10.34 ± 3.47	102.45 ± 103.26	-0.611	0.541*
Days of vaginal bleeding		9.79 ± 1.76	11.92 ± 1.91	-4.688	< 0.001
Return time of menses		28.58 ± 2.67	31.24 ± 2.43	-4.238	< 0.001
Duration of menstruation		6.12 ± 1.12	5.11 ± 0.98	-2.681	0.007
Menstrual volume after return of menses	More than previous	6	3	16.472	< 0.001
	Equal to previous	74	53		
	Less than previous	12	36		

Note: *: indicates a statistically significant difference compared to before treatment

Table 3 Comparison of response rate between two groups

Item	Cured	Effective	Ineffective	Overall response rate (%)
Combined medication group ($n=92$)	87	3	2	97.83
Uterine curettage group ($n=92$)	41	33	18	80.43
χ^2	54.331			
P	< 0.001			

Discussion

Recent years have witnessed a tendency for induced abortion to be performed on younger patients, resulting in a yearly increase in induced abortion rates among adolescents [16]. This is not only a medical issue regarding induced abortion, but also an issue of women's reproductive health, as well as a demographic and social issue [17]. Currently, the most mature and commonly used protocols for induced abortion are vacuum aspiration and mifepristone with misoprostol. Vacuum aspiration, although substantially higher in the rate of complete abortion than MA, is an invasive procedure that results in a high level of pain, perforation of the uterus, abortion syndrome, and incomplete suction for patients. The complete abortion rate of MA is about 90%, with about 9% incomplete abortion rate and about 1% medical abortion failure rate [18]. Women with unwanted pregnancies typically struggle to decide between surgical and medical abortions. Surgical abortion is highly painful with numerous complications, whereas medical abortion is associated with a total of 10% of incomplete abortions and abortion failures. Incomplete medical abortion is often managed by evacuation, which is associated with great pain and physical damage. Therefore, there is a strong need for women with unwanted early pregnancies

to explore highly effective pharmacological options for the treatment of incomplete MA.

Incomplete MA correlates with reasons such as the presence of an excessively anterior or posteriorly inclined uterus in the patient herself, the number of pregnancies and deliveries, and the number of uterine maneuvers [19]. Pharmacological options for terminating early pregnancies have been developed worldwide over the past four decades in the hope of minimizing the complications and psychological burden associated with induced abortion in pregnant women [20]. All currently available medications fall into four categories: mifepristone, misoprostol, estrogens, progestins, and herbal preparations. Misoprostol, a derivative of prostaglandin E1 (PGE1), has been extensively applied in the field of obstetrics and gynecology since its introduction to the market in 1985, with favorable clinical outcomes [21]. Studies have shown that misoprostol applied alone to terminate early pregnancy was associated with a 76% complete abortion rate [22]. Mifepristone (RU486), a progesterone antagonist, has a fivefold higher affinity for progesterone receptors than progesterone. It is a safe agent for the effective termination of pregnancy [23]. Drospirenone and ethinylestradiol (II) is a combination oral contraceptive (COC) consisting of 3 mg drospirenone and 0.02 mg ethinylestradiol encapsulated by b-cyclodextrin. It results in significantly fewer side effects such as swelling, breast tenderness, nausea and other side effects in comparison with other estrogen-progestin medications, and also delivers additional benefits in the treatment of acne [24]. Xinshenghua granules are a proprietary Chinese medicine preparation made by Modified Shenghua Decoction, to which safflower and motherwort are added to the original formula to activate blood circulation and remove blood stasis. The proprietary formulation is more easily stored, carried and taken orally [25]. Xinshenghua granules are now being used more frequently in medical abortion. It has been reported in the literature to facilitate the expulsion of deciduas after medical abortion and to reduce vaginal bleeding [25].

Several studies have shown the application of monotherapy with some success, while a higher success rate is mostly achieved when multiple drugs are combined. Mifepristone and misoprostol are the classic regimens for MA. Mifepristone acts as antiprogesterone to cause apoptosis of chorionic villi and decidual cells, which on the one hand increases prostaglandin synthesis, enhances fibrinolytic activity, and strengthens collagen decomposition of the cervix, and on the other hand, strengthens the coupling and synchronization between uterine myoblasts and activates myometrium's sensitivity to prostaglandins. Misoprostol acts on prostaglandin receptors on uterine myocytes, synchronizing their rhythmic contractions and inhibiting the formation of cervical collagen. Both of them are used together successively to achieve a series of effects such as degradation of deciduas and chorionic villi, hemorrhage, detachment, rhythmic contraction of uterine myometrium, promotion of cervical ripening, etc., facilitating the expulsion of the embryo sacs and the deciduas from the uterine cavity. The combined use of the two has also achieved favorable outcomes in the repeated application of incomplete medical abortion, promoting the disintegration and shedding of the deciduas and part of the chorionic villous tissue [26].

In this study, the combined medication group was administered 2 drospirenone and ethinylestradiol tablets (II) daily for 12 consecutive days to modulate the proliferative and secretory state of the endometrium. The efficient estrogen given also laid the foundation of sensitivity for the subsequent action of misoprostol in the myometrium. After the withdrawal of drospirenone and ethinylestradiol tablets (II), the endometrium was suddenly deprived of hormonal support, resulting in the onset of degenerative shedding. Mifepristone was subsequently administered for 2 days, which acted as an antiprogestogen to render the endometrial cells apoptotic. The above two drugs synergistically promoted endometrial shedding. Misoprostol on day 15 facilitated the rhythmic contraction of the uterus, resulting in a large amount of endometrium being expelled from the uterus in a short period of time, which was already being gradually shed. In this combined regimen, misoprostol serves as the "trigger". The endometrium and blood carry the residual deciduas and part of the pregnancy tissue out of the uterine cavity as a result of incomplete medical abortion, eventually performing the pharmacological treatment for incomplete medical abortion.

The physiological mechanisms of the four-drug combined regimen in treating incomplete medical abortion can be explained as follows. Drospirenone and ethinylestradiol tablets first regulate the endometrium into a proliferative and secretory state that is more sensitive to the effects of subsequent drugs. The withdrawal of these tablets leads to degenerative endometrial shedding. Mifepristone then acts as an antiprogestogen to induce apoptosis of endometrial cells and chorionic villi, further promoting the disintegration of the endometrium and pregnancy tissue. Finally, misoprostol stimulates rhythmic uterine contractions, resulting in the rapid expulsion of the shed endometrium and residual products of conception. Xinshenghua granules, a Chinese herbal medicine, also help invigorate blood circulation and expel the uterine contents. The coordinated actions of these four drugs work together to pharmacologically treat incomplete medical abortion.

This study provides new insights into the efficacy of a novel four-drug combined regimen for treating incomplete medical abortion. While previous studies have

explored various pharmacological options, they mostly involved single drugs or two-drug combinations. Our study demonstrates that the combination of drospirenone and ethinylestradiol tablets, mifepristone, misoprostol, and the Chinese medicine Xinshenghua granules can achieve a high complete abortion rate comparable to that of surgical uterine curettage. This combined regimen offers a less invasive and potentially safer alternative for managing incomplete medical abortions. The detailed physiological mechanisms elucidated in our discussion provide a theoretical basis for the synergistic actions of these drugs. Furthermore, this study highlights the potential of integrating traditional Chinese medicines like Xinshenghua granules into modern pharmacological treatments for gynecological conditions.

Nonetheless, there are limitations to this study. First of all, all included patients were from one hospital with regional and personnel limitations. Moreover, there were problems of smaller sample size, shorter study period, and non-broad personnel range. For this reason, a larger sample size and scope and a longer time for the study are needed for deeper observation. Secondly, animal experiments related to the research were not carried out due to financial and time constraints. Therefore, relevant studies on the mechanism of drug action could not be carried out and need to be further discussed. Further, the present work has incomplete observation indexes due to the limitation of conditions. In this regard, indexes such as endothelial thickness, pelvic effusion, red blood cells, hemoglobin, platelets, and plasma prothrombin time should be added. By doing so, the efficacy status of patients before and after treatment can be observed in more detail in order to optimize the comprehensiveness and refinement of this research topic.

Conclusion

The combined regimen of drospirenone and ethinylestradiol tablets (II), mifepristone, misoprostol, and Xinshenghua granules boasts favorable efficacy for the treatment of incomplete MA, and is equally efficient as compared to uterine curettage. Patients treated with pharmacological treatment experienced longer vaginal bleeding times than those treated with uterine curettage. Moreover, pharmacological treatment is superior to uterine curettage both in terms of pain suffered and time to first return to menses, with no significant difference in terms of adverse effects between the two treatments.

Author contributions

Conception and design of the research: Zhang LA, Feng YL. Acquisition of data: Feng YL, Zhang LA. Analysis and interpretation of the data: Feng YL, Zhang LA. Statistical analysis: Feng YL, Zhang LA. Obtaining financing: None. Writing of the manuscript: Feng YL, Zhang LA. Critical revision of the manuscript for intellectual content: Zhang LA.

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Data availability

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of Children's Hospital of Shanxi(IRB-KYYN-2023-015), and informed consent was obtained from all participants. As this was an observational study and not a randomized controlled trial, it was not registered in a clinical trial registry.

Consent for publication

N/A.

Competing interests

The authors declare no competing interests.

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